EMERGENCY!

WXY 9 1 1

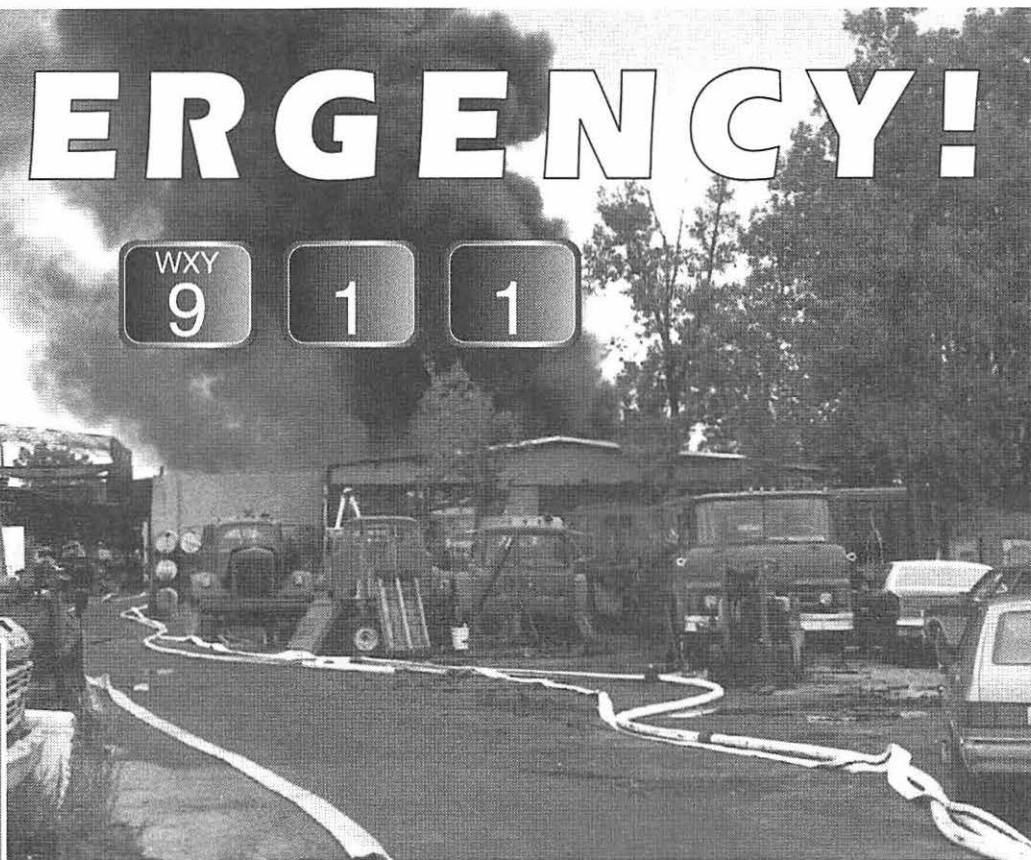## Advanced emergency dispatch centers are changing the way public officials are responding to our calls for help

By Jack Sullivan

Nearly everyone is familiar with the increasingly common-place "9-1-1" emergency telephone access system. A simple, nearly universal, and easy to remember phone number puts you into immediate contact with the dispatchers who control the vital services of fire, police, and paramedics. Even those who do not yet have direct 9-1-1 access are familiar with the popular TV series that dramatizes the tremendous contributions to personal safety that this service represents.

Few people, however, have had a chance to look behind the scenes at a busy 9-1-1 emergency communications system and to fully appreciate how this important service directly effects nearly everyone in the United States. Recently I decided I wanted to learn more about 9-1-1, how the system works, and how it impacts on the lives of those who depend on it for protection.

I could have gone to the emergency communications center of any good-sized community or large suburban area. But as I turned my car into the driveway of the modern one-story building with its imposing radio towers, I knew that this one had special meaning to me. I was about to visit the communications center in Hunterdon County, New Jersey—the facility that serves the major suburban area in which I live.

I had chosen to visit this facility not only because of its closeness to my home but also because it is fairly representative of the communications centers serving many of the *MT* readers who live in the suburbs of major metropolitan areas. Hunterdon County (population 113,674 spread over 429.6 square miles) is a thriving mix of rural and small metropolitan areas located almost exactly midway between New York City and Philadelphia. A significant amount of light industry co-exists with agricultural ventures, plus a heavy influx of shoppers from adjacent areas who visit the numerous discount shopping centers. Running through the county is a major interstate highway (I-78) and a busy railroad mainline (Conrail's Lehigh line).

A geographical description of the county includes a broad mix of

features, ranging from river bottom flat land to steep mountains (yes, even in New Jersey!) and a deep river valley (the Delaware). Add to all that a couple of state prisons and reform schools, plus a major medical center, and I think you will agree that Hunterdon County routinely deals with the full range of emergency communications that you would expect anywhere.
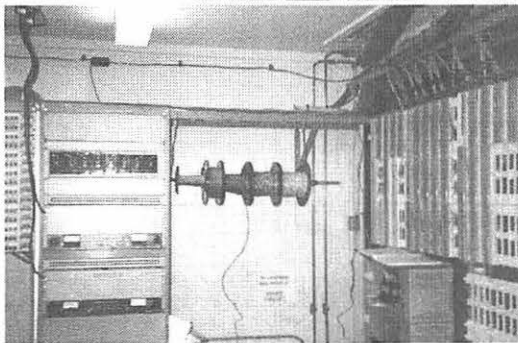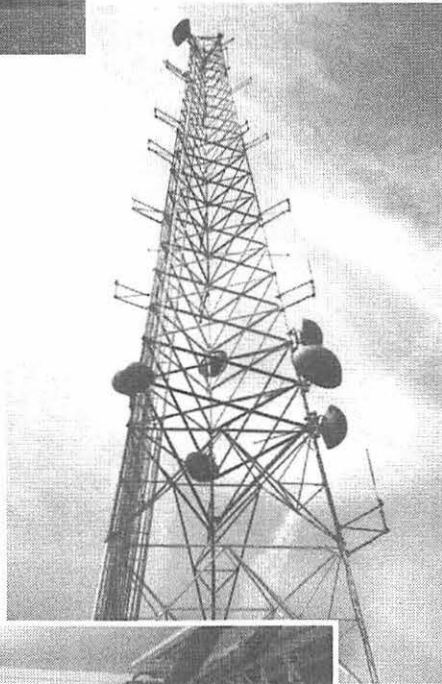
The 9-1-1 System

While the concept of a national emergency access phone number has been around in the United States since the late 1960s, this type of universal system had already been in place in Britain since 1937.

Following a recommendation by the President's Commission on Law Enforcement, the numbers 9-1-1 were decided upon and were reserved by AT&T for this purpose. Implementation of a nationwide 9-1-1 system was given further impetus in 1973 when the Office of Telecommunications Policy issued a national policy statement recognizing the benefits of 9-1-1 and encouraging its use. The system has been developing slowly ever since.

Today, 11 years later, about 75% of the country is covered by 9-1-1. New Jersey, in parallel with many other states, mandated implementation of 9-1-1 systems in 1990, and has proceeded to install it on a county by county basis.

Before 9-1-1, emergency communications were routed directly to the individual services involved. If there was a fire, you called the fire department; if there was an accident, you called the police. Coinciding with the development and growth of 9-1-1 has been a move by local governments to consolidate communications and emergency dispatch services into centralized, multiagency communications centers. Not only has this trend brought together different agencies, but, in the case of

The Hunterdon Co. emergency communications center is ideally situated on the highest point around. The tower is used by the State Police 800 MHz trunked system as well.

Modern switching methods and a comprehensive computer database helps ensure the call is answered, the caller is identified regardless of their ability to speak, and the appropriate service is dispatched to help.

larger counties, it has also brought together adjacent communities under the single umbrella of a central communications agency.

Staffed by dispatchers, service technicians, and a full-time director to oversee operations and planning, the consolidated communications center (or comm center, as it is usually called) is supported financially by its component community members.

The savings and efficiencies in this type of system are enormous. Staffing one center rather than several brings obvious benefits. There are also great savings in terms of needing fewer emergency phone lines and radio frequencies. The centralized communications approach also provides for more efficient utilization of resources in situations requiring prompt coordination of resources between member communities in "mutual aid" situations.

The original 9-1-1 system, known as Basic 9-1-1, only functioned by switching an incoming call to the location where the dispatchers were located. Each emergency service usually had its own dispatcher and the incoming calls were usually transferred to the dispatcher responsible for that service. In many cases the dispatchers were still located at remote sites, and there would be a delay while the incoming call was transferred.

The present system standard is Enhanced 9-1-1, or E9-1-1. In the basic system, the operator receiving the incoming emergency call would not know the phone number or location of the person calling. In Enhanced 9-1-1, two key pieces of information are immediately displayed on the computer screen of the dispatcher answering the call: ANI (Automatic Number Identification) and ALI (Automatic Location Identification). The computer screen displays the phone number, the address where the phone is located, the name the phone is listed under, the type of location (residential, store, etc), additional location information ("second floor, Apartment #5," for example), and the identity of each of the emergency services that have jurisdiction at that location.

The heart of Enhanced 9-1-1 is a computer located either at the main switching center of the telephone company serving the area, or at the communications center. This computer stores all of the information discussed above in a "database." (An address book is an example of a simple database.) Basically, the database program responds to the ANI information from the phone

company switching center by looking up the ALI information associated with it and making it available almost instantly to the receiving dispatcher. (ANI data is also the basis for the Caller ID service being marketed by phone companies in many areas.)

The Hunterdon County database has over 60,000 ALIs. As with any database, constant maintenance is needed in order to keep up with changes and to correct errors when they are identified. About 3800 of the ALIs in the Hunterdon County database are currently "bad" (about 6%). Anyone familiar with database management will recognize that this is still a pretty good average.

There are a number of interesting features in common between Basic and Enhanced 9-1-1. One is coin-free dialing from coin-operated telephones. A second is termed "called party control." This feature allows the emergency communications center to hold a call for tracing by the telephone company by simply not hanging up.

Another interesting ability of all 9-1-1 systems is called "emergency ringback." An emergency dispatcher can ring the phone that has just called 9-1-1, even though they have hung up, as long as the dispatcher has not disconnected. The 9-1-1 dispatcher can also differentiate between a hang up and a caller who is either unable or unwilling to speak, using "calling party switch hook status indication."

A basic part of any 9-1-1 system is a UPS, or uninterruptable power source. With their computers and radios totally dependent on electric power, emergency communications centers employ heavy-duty rechargeable battery UPS units backed up by oil- or propane-fueled emergency generators.

Hunterdon County's emergency communications center has its own telephone "switch," in which eight trunk lines terminate to handle incoming 9-1-1 calls. Incoming 9-1-1 calls enter the facility on fiber-optic cables from two different outside sources. This duplication of a critical asset (known as redundancy), provides greater security in emergency situations.

Anatomy of a High-Tech 911 Center
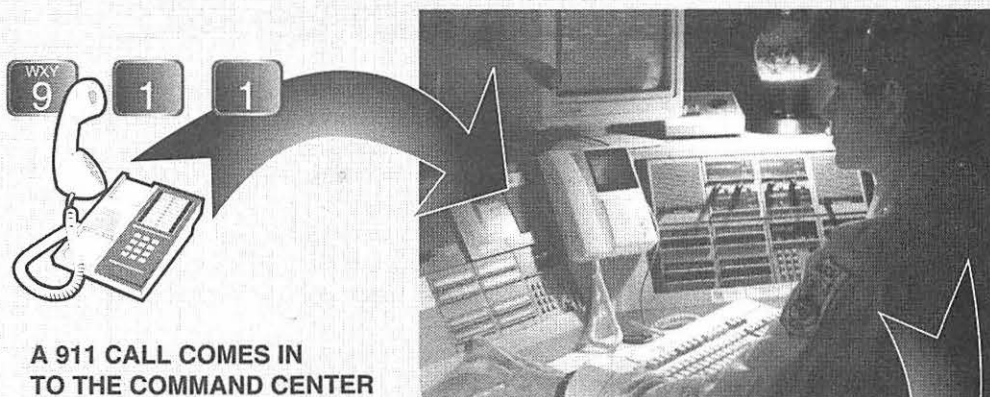
A 911 CALL COMES IN TO THE COMMAND CENTER
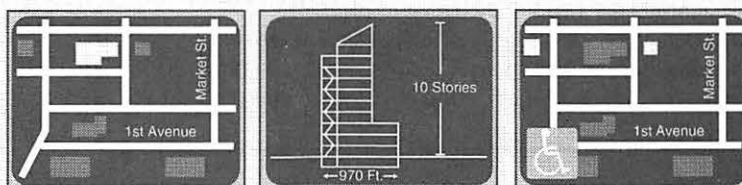
COMPUTER DISPLAYS
Maps show all structures within a block of the caller. Other information lists addresses, building names and heights, disabled residents, a log of past calls from the area and a summary of potentially hazardous materials.

CITYWIDE NETWORK
Information is relayed to police precincts, fire stations and nearest ambulances, as appropriate.

▦ How it Works in Practice

Inside the emergency communications center, incoming 9-1-1 calls are automatically routed to the first available dispatcher. Besides providing essential 9-1-1 ANI and ALI information, the dispatchers' computers are used for Computer Aided Dispatch (CAD). In this system, the same screen displaying the 9-1-1 data is used to record and keep track of the status of dispatched emergency units. In overload situations, where more calls are being received than can be handled by the available dispatchers, alternate routing will automatically switch calls to another facility.

No one calling 9-1-1 is ever supposed to receive a busy signal. (Other uses for dispatcher computers include the national NCIC and the New Jersey SCIC systems for tracking wanted persons, vehicles, etc.)

All calls to a 9-1-1 facility are recorded on magnetic tape which is then subsequently saved for a time in case there is a need to review the content of a call. Hunterdon County normally reuses tapes after 90-120 days. In the case of pending legal action, however, tapes can be kept indefinitely. One celebrated local case has put one reel of tape on hold since 1983!

Problems still exist with the proper work-

A Multi-Agency Dispatch Center

Our cover image and the photo at left show off the Fulton County Communications Center in Atlanta, Georgia. This center is second largest in the nation, and integrates their E9-1-1 system with computer-aided dispatch, automated vehicle locator, mobile data terminal, and 800 MHz trunked radio systems for all the public safety agencies of Fulton County.

When it's a seamless and integrated system, there are some real advantages to housing so many related services under one roof. Sharing E9-1-1 support and dispatch positions in the FCCC are Fulton Co. Police and Fire Departments, Palmetto Police and Fire Departments, Grady Emergency Medical Service, Fulton Co Sheriff's Dept, and Fulton County Marshal's Office. Since the center opened in 1984, this has been an ongoing consolidation, so we don't know where they intend to stop!

Two tours of this high-tech facility are currently in the planning stage for a limited number of Grove Expo attendees. Sign up when you preregister, or call 1-800-438-8155 to place your name on the list for the tours which will take place October 13.

---

ing of the 9-1-1 system. Calls from PBX systems (Private Branch Exchanges), for example, do not indicate the ANI/ALI data for the extension originating an emergency call. Instead, the data for the main trunk number of the PBX is displayed. In some cases this has resulted in death, due to delays in dispatching the correct emergency response for the location of the caller, which may not be the same as that of the main PBX trunk number.

Another problem for 9-1-1 operations is caused by cordless telephones. Many owners of these radio units program 9-1-1 into the speed-dial memory of the unit. Reportedly, many false 9-1-1 dialings have been caused by cordless phones with weak rechargeable batteries. This problem has diverted valuable resources in many cases when it has been necessary to send a police patrol car to an address to check on the nature of the problem. The newer 46/49 and 900 MHz cordless phones may help to reduce this problem.

The mushrooming use of cellular telephones has also created problems for 9-1-1 emergency dispatch services, and it's expected the coming Personal Communications Networks (PCNs) will produce similar difficulties. The basic problem stems from the fact that a person who places a mobile 9-1-1 call provides the emergency dispatch operator with only the ALI of the cellular site. The location of the cellular phone itself, being mobile, cannot be made available to the dispatcher. Calling the cellular phone (emergency ringback) is also not possible.

Some communities and cellular phone companies provide access to the local state police when 9-1-1 is dialed from a cellular phone, but this solution is by no means universal. Many systems have a feature that alerts the dispatcher to the cellular origin of the call so that the right questions can be asked about location, etc. Some communities have even tried to shut out 9-1-1 calls from cellular phones which are not part of a local system (roamers). The more progressive plans call for cellular phone companies to make the necessary investment in equipment so that at least the cellular origin of a call and emergency ringback are made possible.

▌ The Hunterdon Co. Radio Dispatch System

Taking advantage of the mountainous terrain that passes through the center of the county, the Hunterdon County emergency communications center is ideally situated on a main road at nearly the highest point around—about 700 feet above sea level. There are two radio towers, the larger one being owned by the New Jersey State police and used by them as a key hub in their statewide 800 MHz trunked radio system.

Despite the excellent location of the communications center, the rugged terrain creates a number of areas where additional radio facilities are required for adequate coverage. A number of remote receivers and base stations are controlled by a combination of leased telephone lines and point-to-point microwave.

Hunterdon County established the first county-wide 9-1-1 emergency communications system in New Jersey in 1977. Helped greatly by a major 1976 grant from the Robert Wood Johnson Foundation (of the famous Johnson & Johnson family), 4-channel Motorola radios were purchased and configured as shown in Table 1.

A number of things have changed since the original communications system was set up. New radio transceivers are frequency-synthesized and have channel capacities than can exceed 100. While still adhering to the basic countywide system, some communities

---

TABLE 1
Hunterdon County, NJ, Four-Channel System

POLICE:

Chan 1	Tactical/prosecutor (Repeater: 154.965T/158.955R)	
Chan 2	North county sector (Repeater: 154.785T/158.91R)	
Chan 3	South county sector (Repeater: 154.815T/159.03R)	
Chan 4	Car-to-car direct (Simplex: 154.965T/R)	

FIRE:

Chan 1	Primary dispatch/operations (Simplex: 33.74T/R) (*Tone alerting on this channel triggers home monitors, pagers and community sirens.*)
Chan 2	Secondary/fireground (Simplex: 33.68T/R)
Chan 3	Secondary/fireground (Simplex: 33.62T/R)
Chan 4	Secondary/fireground (Simplex: 33.58T/R)

AMBULANCE (EMS):

Chan 1	Tactical/police coord. (Repeater: 154.965T/158.955R) (*This channel is also used for air-to-ground coordination during helicopter MEDEVAC operations.*)
Chan 2	Dispatch/operations (Simplex: 155.205T/R) (*Tone alerting of the same type as used for the fire departments is used on this channel.*)
Chan 3	Ambulance-to-hospital ER (HEAR system) (155.34T/R)
Chan 4	Ambulance-to-ambulance/police coord (Simplex: 154.965T/R)

Note: 155.400 has been applied for as an additional ambulance channel.

"MED 8" (463.175T/468.175R) is the primary hospital-ambulance paramedic channel, backed up by "MED 3" (463.05T/468.05R). Biomedical telemetry can be found on 458.175.

TABLE 2: Miscellaneous Hunterdon Co. Frequencies

The common subaudible tone squelch frequency for Hunterdon County is 192.8 Hz. Since these channels are shared with communities in other counties, monitoring these channels is a lot more enjoyable with a scanner capable of decoding the local tone frequency.

154.68	State Police Emergency Network (SPEN) channel 1 - common interagency frequency. (*All SPEN stations use the New Jersey State Police subaudible tone of 131.8 Hz. A digital identifier burst can be heard at the end of each transmission.*)
155.475	SPEN 2 - Nationwide police emergency - interstate communications and backup for SPEN 1.
154.725	SPEN 3 - Statewide non-emergency interagency channel.
153.785	SPEN 4 - Statewide interagency coordination channel.
33.04	Rescue alerting, simulcast with 155.205.
155.34	Hunterdon Medical Center HEAR channel, monitored by the county dispatchers. The base station and antenna are located at the 9-1-1 communications center and is controlled remotely by the hospital.
155.385T/R	Hunterdon Medical Center security.
151.07T/159.00R	County road department repeater.
151.235T/159.255R	County park system & rangers repeater.
153.755T/R	County jail operations and security (Flemington)
462.575T/467.575R	Emergency Management repeater (F1)
462.575T/R	Emergency Management simplex (F2)
462.575T/467.575R	Health Department F1 (tone 186.2)
453.90T/458.90R	Health Department F2 (tone 186.2)
462.675T/467.675R	Health Department F3 (primary) (tone 186.2)

have their own alternate channels in the local government radio service programmed into their radios. Frequent references can be heard to "switch up" or "go to channel 12." Unless you know what these frequencies are, there is no way to eavesdrop on these communications. (In the case of Raritan Township, the author has confirmed that this reference signifies the local government channel of 151.205 MHz.)

▉ 9-1-1 - A Nationwide System?

After visiting the Hunterdon County emergency communications facility and seeing firsthand the advantages of the 9-1-1 system, it is difficult to understand why the entire country has not gotten solidly behind this excellent program. In many areas the problem is money—either getting it or spending it. In others it is simply resistance to change, fear of loss of local power, or a combination of such human factors.

As I was preparing this article, I was fortunate enough to be able to purchase a copy of an exellent book: *The 9-1-1 Puzzle.* Published by the non-profit National Emergency Num-

ber Association (NENA), this book gives a thorough historical and technical description of the 9-1-1 system. It also does a great job in explaining the benefits of 9-1-1 and how to go about selling the 9-1-1 concept to your local government officials through education. I would suggest you start by encouraging your local library to obtain a copy and then ask your local newspaper to plug its availability.

Information and support may be forthcoming in other ways. the NENA National Office offers guidance, advice, counsel, wisdom, support, leadership, and direction to communities working to set up a 9-1-1 system. In particular, NENA may be able to help your efforts by putting you in touch with some of their members who have experience with your particular need. If your community already has 9-1-1, it is my hope this article has given you some insight and appreciation for this unique marriage of technology and trained personnel.

Bibliography & Suggested Reading:

The 9-1-1 Puzzle: Putting All the Pieces Together. A Guide for the Implementation and Operation of 9-1-1, by Sue Pivetta. First edition, 1993. Published by the National Emergency Number Association, 110 South Sixth Street/P.O.Box 1190, Coshocton, OH 43812-6190. Tel. (614) 622-8911. ISBN 1-883119-15-4. 162 pages, hardbound. List price $45.

9-1-1 Magazine. Published by Dispatch, Inc. Randall Larson, editor. PO Box 11788, Santa Ana, CA 92711; 1-800-231-8911.